



Electromagnetic Railgun

AT A GLANCE

WHAT IS IT?

The EM Railgun launcher is a long-range weapon that fires projectiles using electricity instead of chemical propellants. Magnetic fields created by high electrical currents accelerate a sliding metal conductor, or armature, between two rails to launch projectiles at 4,500 mph.

HOW DOES IT WORK?

- Electricity generated by the ship is stored over several seconds in the pulsed power system.
- Next, an electric pulse is sent to the railgun, creating an electromagnetic force accelerating the projectile up to Mach 6.
- Using its extreme speed on impact, the kinetic energy warhead eliminates the hazards of high explosives in the ship and unexploded ordnance on the battlefield.

WHAT WILL IT ACCOMPLISH?

- With its increased velocity and extended range, the EM Railgun will give Sailors a multi-mission capability, allowing them to conduct precise naval surface fire support or land strikes; ship defense; and surface warfare to deter enemy vessels.
- Navy planners are targeting a 100+ nautical mile initial capability.
- A variety of new and existing naval platforms are being studied for integration of a future tactical railgun system.

POINT OF CONTACT:

Roger Ellis
Program Officer
roger.ellis@navy.mil



The Department of the Navy's science and technology corporate board chartered the Innovative Naval Prototype (INP) construct to foster game-changing and disruptive technologies ahead of the normal requirements process.

The Electromagnetic Railgun INP was initiated in 2005. The goal during Phase I, a proof-of-concept demonstration at 32 mega-joule muzzle energy, has been achieved. A future weapon system at this energy level would be capable of launching a 100+ nautical mile projectile. This launch energy has the advantage of being able to stress many components to evaluate full-scale mechanical and electromagnetic forces.

Phase I was focused on the development of launcher technology with adequate service life, development of reliable pulsed power technology and component risk reduction for the projectile.

Phase II, which started in 2012, will advance the technology for transition to an acquisition program. Phase II technology efforts will concentrate on demonstrating a rep-rate fire capability. Thermal management techniques required for sustained firing rates will be developed for both the launcher system and the pulsed power system.

The railgun is a true warfighter game changer. Wide-area coverage, exceptionally quick response and very deep magazines will extend the reach and lethality of ships armed with this technology.

Research Challenges and Opportunities:

- Advanced thermal management techniques for long slender metal rail structures
- Extended service life for materials and components in harsh environment
- High-strength, dielectric, structural materials
- High-speed, high-current metal-on-metal sliding electrical contact
- System interfaces between high-power loads and platform power distribution
- Compact pulsed power systems and power electronics
- High-conductivity, high-strength, low-density conductors
- Repetitive rate switches and control technologies
- Aerothermal protection systems for flight vehicles
- High-acceleration tolerant electronic components and structural materials